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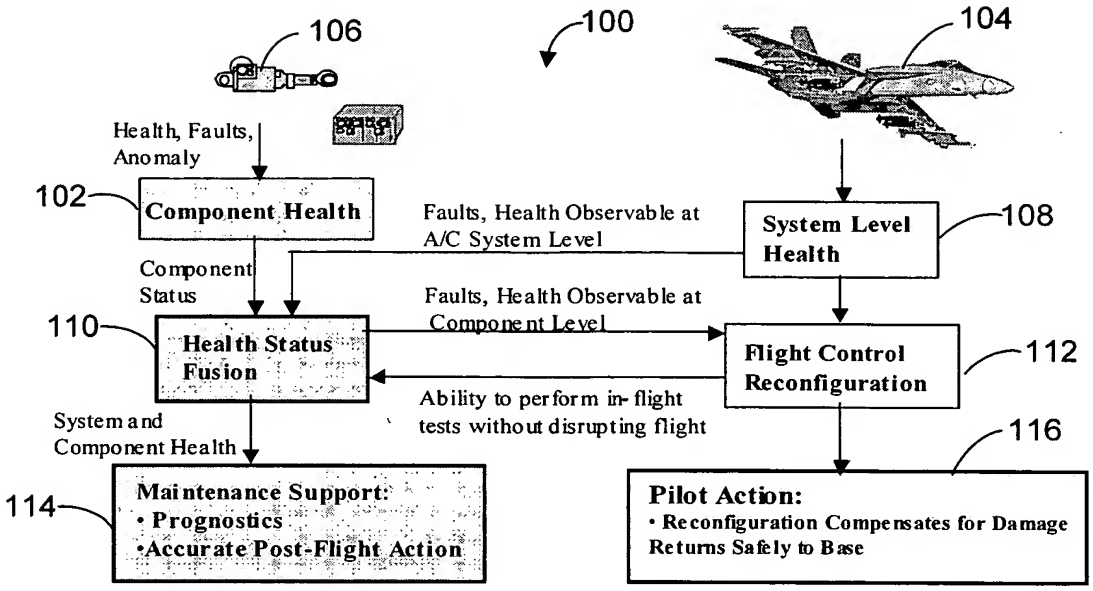

FIG. 1

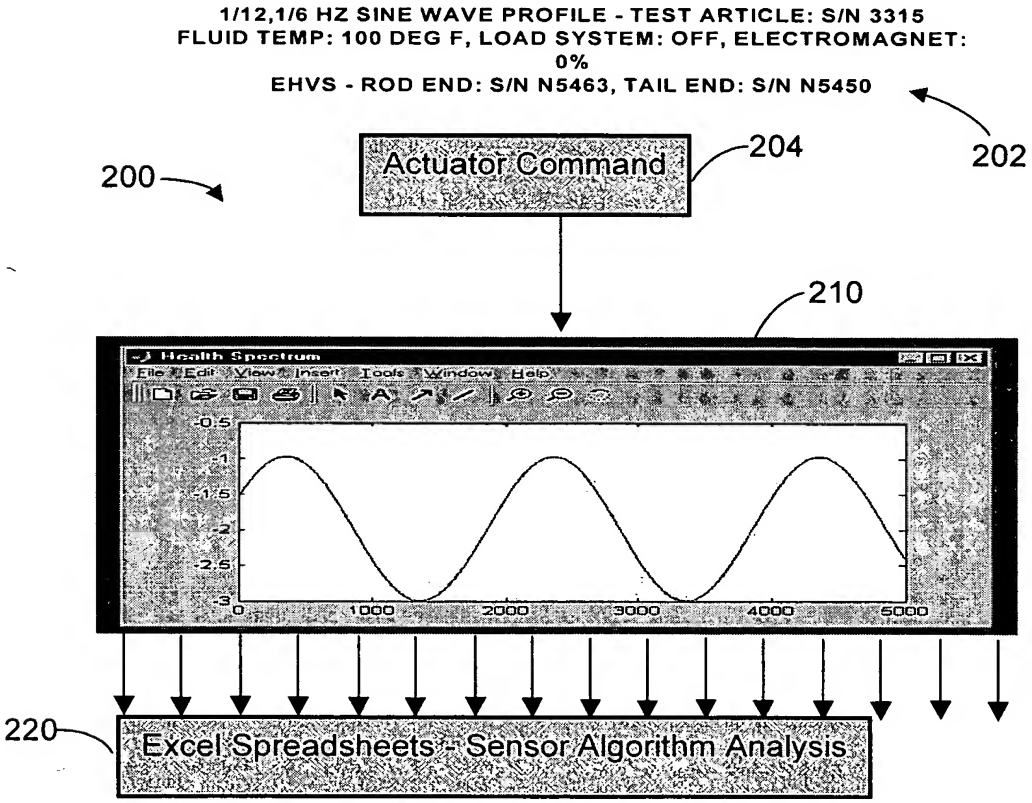

FIG. 2

Sensor Parameters

210

- TIME > TIME [seconds]
- 8237 > CH. 1 MAIN RAM POSITION [inches]
- 8238 > CH. 2 MAIN RAM POSITION [inches]
- 8239 > CH. 1 MCV POSITION [inches]
- 8240 > CH. 2 MCV POSITION [inches]
- 8241 > CH. 1 SERVOAMP CURRENT [milliamps]
- 8242 > CH. 2 SERVOAMP CURRENT [milliamps]
- 8243 > CH. 3 SERVOAMP CURRENT [milliamps]
- 8244 > CH. 4 SERVOAMP CURRENT [milliamps]
- 8245 > CH. 2 FAIL SENSOR NO. 1 LVDT POSITION [Vrms]
- 8246 > CH. 2 FAIL SENSOR NO. 2 LVDT POSITION [Vrms]
- 8201 > STABILATOR ACTUATOR COMMAND [INCHES]
- 8268 > LOAD ACTUATOR COMMAND [pounds]
- 8312 > LOAD ACTUATOR LOAD CELL FORCE [LBS]
- 8430 > HYDRAULIC SYSTEM 1 FLUID TEMPERATURE [deg F]
- 8431 > HYDRAULIC SYSTEM 2 FLUID TEMPERATURE [deg F]
- 8432 > LOAD CYLINDER HYDRAULIC SUPPLY TEMPERATURE [deg F]
- 8433 > LOAD CYLINDER HYDRAULIC RETURN TEMPERATURE [deg F]
- 8015 > STABILATOR ACTUATOR SYSTEM 1 INLET PRESSURE [psi]
- 8016 > STABILATOR ACTUATOR SYSTEM 1 OUTLET PRESSURE [psi]
- 8013 > STABILATOR ACTUATOR SYSTEM 2 INLET PRESSURE [psi]
- 8014 > STABILATOR ACTUATOR SYSTEM 2 OUTLET PRESSURE [psi]

FIG. 3

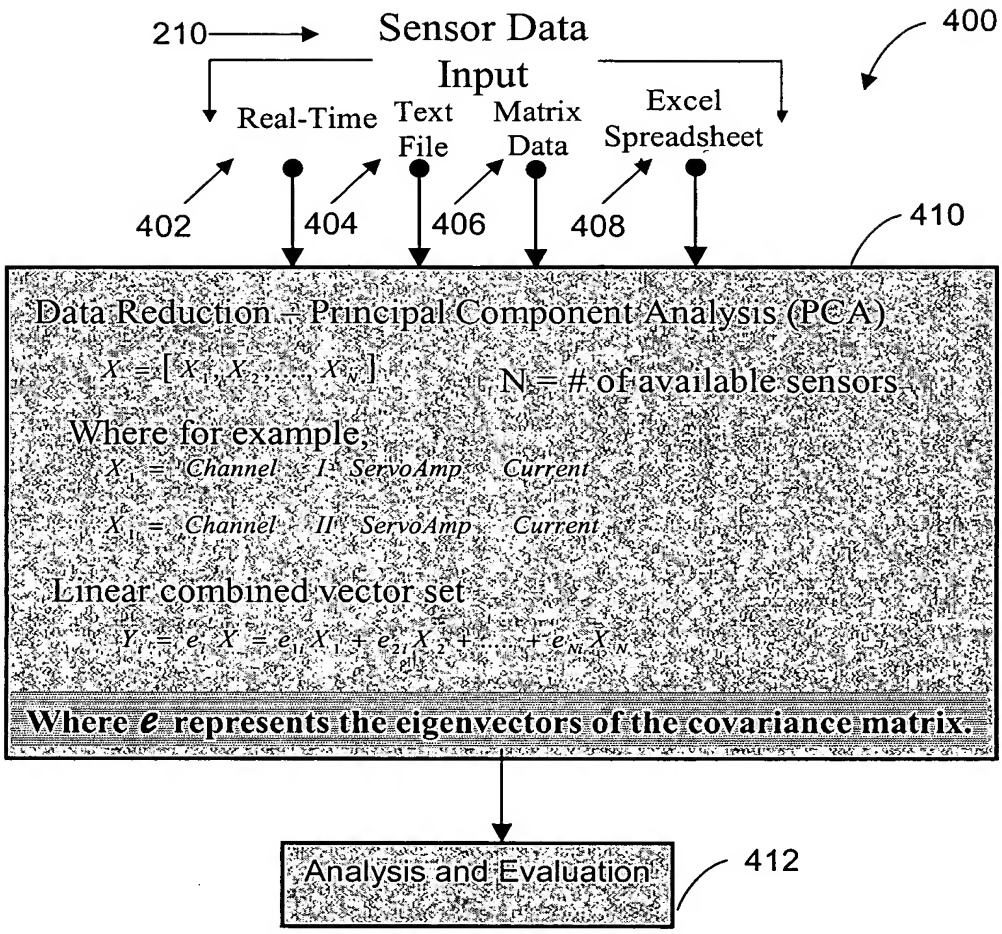
210
Sensor Data Input
400
Real-Time
Text File
Matrix Data
Excel Spreadsheet
402
404
406
408
410
Data Reduction – Principal Component Analysis (PCA)
$X = [X_1, X_2, \ldots, X_N]$
N = # of available sensors
Where for example,
X_1 = Channel I ServoAmp Current
X_{11} = Channel II ServoAmp Current
Linear combined vector set
$Y_i = e_i^T X = e_{1i} X_1 + e_{2i} X_2 + \ldots + e_{Ni} X_N$
Where e represents the eigenvectors of the covariance matrix.
Analysis and Evaluation
412

FIG. 4

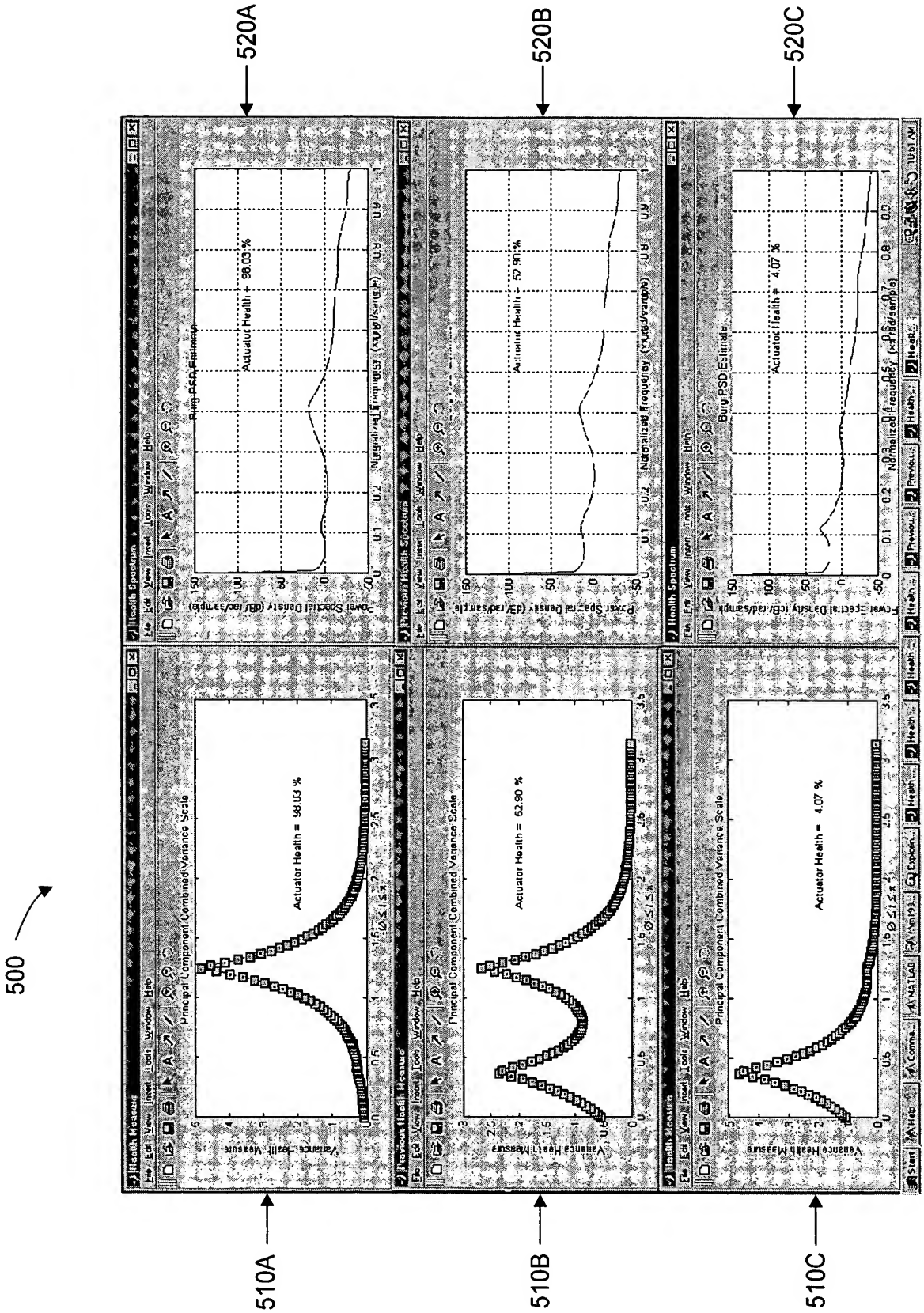
500
510A
510B
510C
520A
520B
520C
Actuator Health = 96.03 %
Actuator Health = 52.90 %
Actuator Health = 4.07 %
Principal Component Combined Variance Scale
Variance Health Measure
Buy PSD Estimate

FIG. 5